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BACTERIAL SPOT OF PEPPERS

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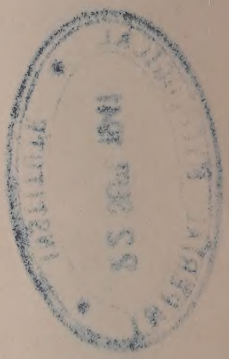
Bacterial spot of peppers *(Phytomonas vesicatorium* (Doidge) S.A.B.) is common and often destructive wherever peppers are grown commercially in Florida. The disease has been found in a large number of the states east of the Rocky Mountains and in several foreign countries. In Florida it has been somewhat erratic in its occurrence and severity since first reported in 1916. Certain seasons have passed with little or no loss reported from pepper-growing centers, while in certain other years heavy losses have been recorded. Growers have occasionally considered abandoning pepper growing on its account. Bacterial spot also attacks tomatoes, the only other host on which the disease has been reported in the state, and causes stem, leaf and fruit spots similar to this pepper disease, except that it is usually not so severe.

The organism causing spot of pepper is seed-borne and may be found on all except carefully grown and selected seed. It may survive from one crop to another on decaying debris from previously infected peppers if the interval is not too great. Many also think that the organism may live free in the soil for indefinite periods, but experiments have not been conclusive. The disease has been found on all of the commercial varieties of peppers grown in the state and observations show the sweet or mild varieties to be more severely affected than the hot varieties.

Bacterial spot is frequently conspicuous enough in the seedbed to be accurately diagnosed, although most often definite characteristics are obscure at transplanting time unless the seedlings are comparatively old. A few diseased seedlings mixed with healthy plants, when commercial fields are set, offer excellent opportunity for inoculation of a large number of plants. In this way entire plantings are exposed to infection. Growers in a neighborhood frequently suffer losses because of the use of diseased seedlings from the same seedbed. In the field the disease develops rapidly and is spread from these first infections to other parts of plants and to adjoining plants principally by dew and rain and to more distant plants in the same field or to adjoining fields by wind and blown humus or sand. Wind-carried sand particles are very injurious to young plants in that they cause considerable destruction of cortical cells of the stems and epidermal tissue of foliage and fruit. These mechanical injuries serve as openings through which the bacteria enter and cause infection. In fields of young plants infections are most frequently found on the side of the plants exposed to wind and sand injury. Infection also takes place through natural openings in the plant, such as water pores and stomata. Sand injury is not so common in fields of older plants and infection is more evenly distributed over the plants.

Plants are susceptible to infection during their entire period of growth. Stems, petioles, peduncles, foliage and fruits are all attacked. Seedlings that become severely infected when young are usually killed. Less severe infection or infection on older plants results in a struggling, stunted, non-productive plant which eventually dies. Occasionally seasonal conditions are



adverse to the development of the disease and as a result fields of plants showing a high percent of infection recover rapidly. On the other hand, plants that were apparently disease-free in the fruiting stage have been reduced to leafless stubs in two or three weeks. The disease is favored by relatively cool weather with high relative humidity, heavy nightly dews and dry windy periods in the middle of the day. Under such conditions the disease may cause defoliation of extensive plantings and a spotting of all pods.

Symptoms.—Early infections of young plants in seedbeds often appear as small, irregular to circular, blackish spots on the cotyledons. On the leaves the spots are more or less circular with a yellow to brown thin membranous central area surrounded by a definite dark, narrow border. Single scattered spots are usually surrounded by a distinct halo extending into the adjacent tissue for a distance equal to the diameter of the lesion. When the spots are numerous these lighter colored, halo areas coalesce, causing portions of the leaf to become yellow. Diseased leaves shed very quickly, often when there are only a few spots evident on their surfaces. Heavily infected leaves are usually shed before becoming noticeably yellow. Rapid defoliation may continue until the plants are devoid of foliage. As the new leaves develop they become infected and in turn are shed before they attain one-third normal size. Under less favorable conditions the leaf spots increase to about ¼ inch in diameter. The center area becomes brown, dries, cracks and falls out, leaving an irregular, jagged hole through the blade. Rapid and almost complete defoliation associated with fruit spotting is a characteristic symptom.

Fruits become infected at almost any size. At first the spots are small, irregular, tan, slightly raised, blister-like infections. They are of little or no consequence unless numerous on immature pods. These spots usually enlarge and become brown. The epidermis ruptures and curls back, exposing a raised, brown, rough surface, wart-like in appearance, but not hard. These pod lesions reduce the market value of the peppers. They offer adequate avenues of entrance for secondary organisms which result in further and more rapid decay of the pods. On the stems the spots are more or less circular, sunken and black, varying in size from 1/64 to 1/4 inch. The larger, older spots are brown to black, rough, hard and often numerous enough to involve most of the cortex of the stem.

The disease has been found occasionally on the calyx and peduncle and resembles the spots occurring on the leaves and stems.

Control.—Rotation should be practiced so that peppers do not follow peppers or tomatoes, especially if the previous crop had shown any of this disease. All pepper seed should be disinfected before planting. They can be treated by soaking for 5 to 7 minutes in a 1:1,000 bichloride of mercury solution or a normal solution of an organic mercury as prescribed by directions on the container. They can be treated with organic mercury dust or with red copper oxide.

The seedbed should be located in a well protected place where full sunshine is available and cold winds and frosts cannot damage the seedlings. When the seedlings are breaking the soil in emerging a normal organic mercury solution should be applied to the surface of the entire bed in sufficient quantity to wet the soil ½ inch deep. When 2 or 3 leaves have developed the entire seedbed should be sprayed with 1-2-50 bordeaux mixture or red copper oxide, or dusted with copper-lime dust when the seedlings are wet.

Plants in the field that show the disease should be thoroughly sprayed with 4-4-50 bordeaux mixture at weekly intervals, until, under average conditions, the new growth develops free from the disease.